

Generic Open Architecture (GOA)

Open Systems Project Engineering Conference (OSPEC)

FY 98 Status Review

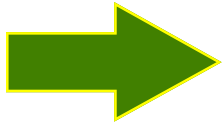
29 April - 1 May 1998

Mike Walsh

**Army Aviation & Missile Systems
Command, Avionics Systems Engineer**

Diane Paul

**Raytheon Systems Company, Software
Engineer**



Overview of GOA Framework

- **Preferred Set of Standards Catalogs**
 - **Need for the Catalogs**
 - **Process for Developing Catalogs**
 - **Status of Avionics Catalog Development**
- **Summary**

Purpose of GOA

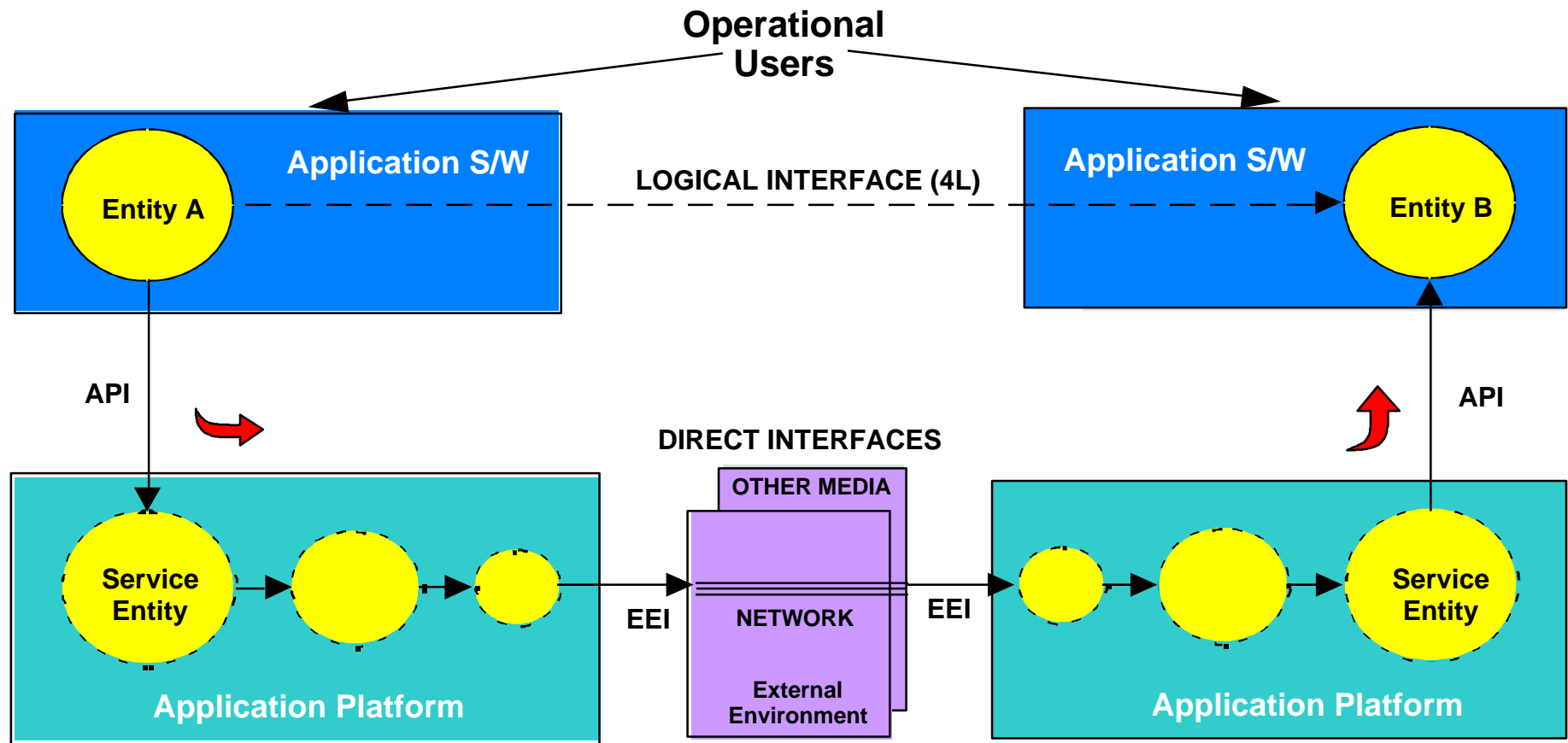
- **Initiated as a framework to classify system interfaces, in order to:**
 - Identify critical interfaces to facilitate application of open system standards to weapon systems
 - Provide a basis for commonality among vendors and users of open system components
- **Benefits:**
 - Basis for establishing set of standards common to elements of major systems
 - Establishes interfaces required for “plug and play” components, allowing more affordable system development and upgrades due to re-use and commonality of components

GOA Framework

- The GOA framework is defined through nine interface classes and four GOA layers, each consisting of multiple system components (see next two foils)
- The interfaces can be:
 - within a hardware module
 - between modules on the same backplane
 - between modules in different backplanes within the same system
 - between subsystems (e.g., mission computer and VMS)
 - between systems (e.g., aircraft and ground based system)

GOA Model

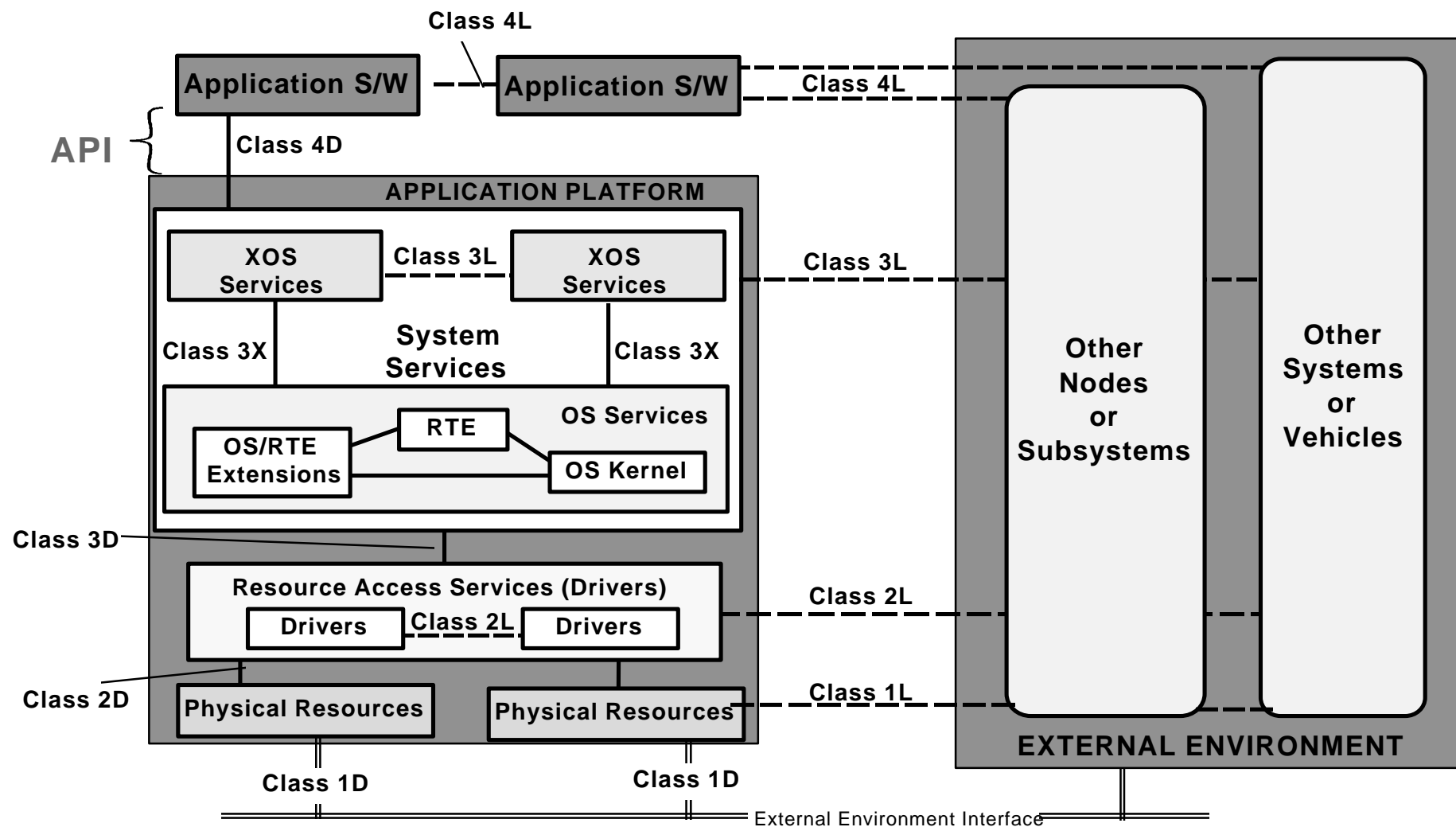
Separates Logical and Direct Interfaces



———— Direct Interface - how information is transferred
 - - - - Logical Interface - what information is transferred

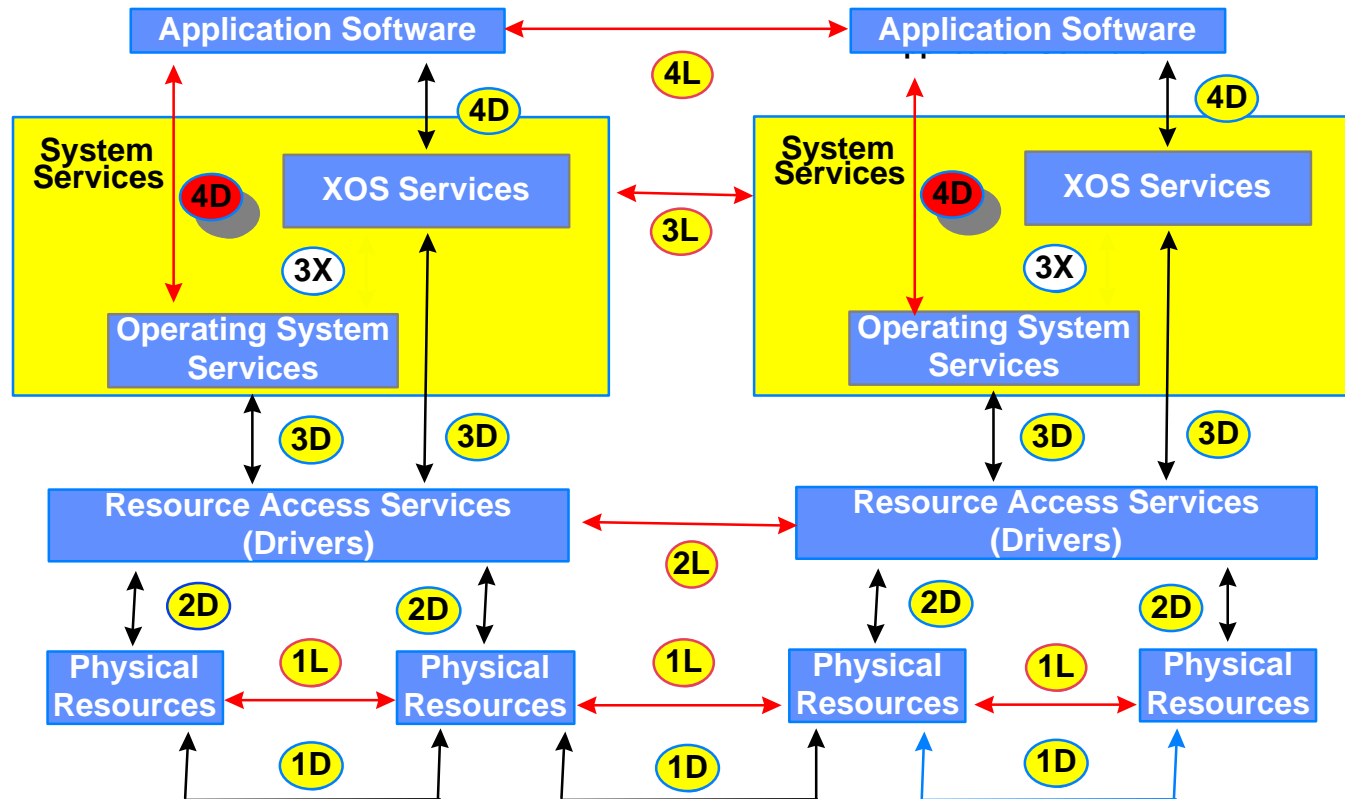
Raytheon GOA Framework - View 1

Interfacing to the External Environment



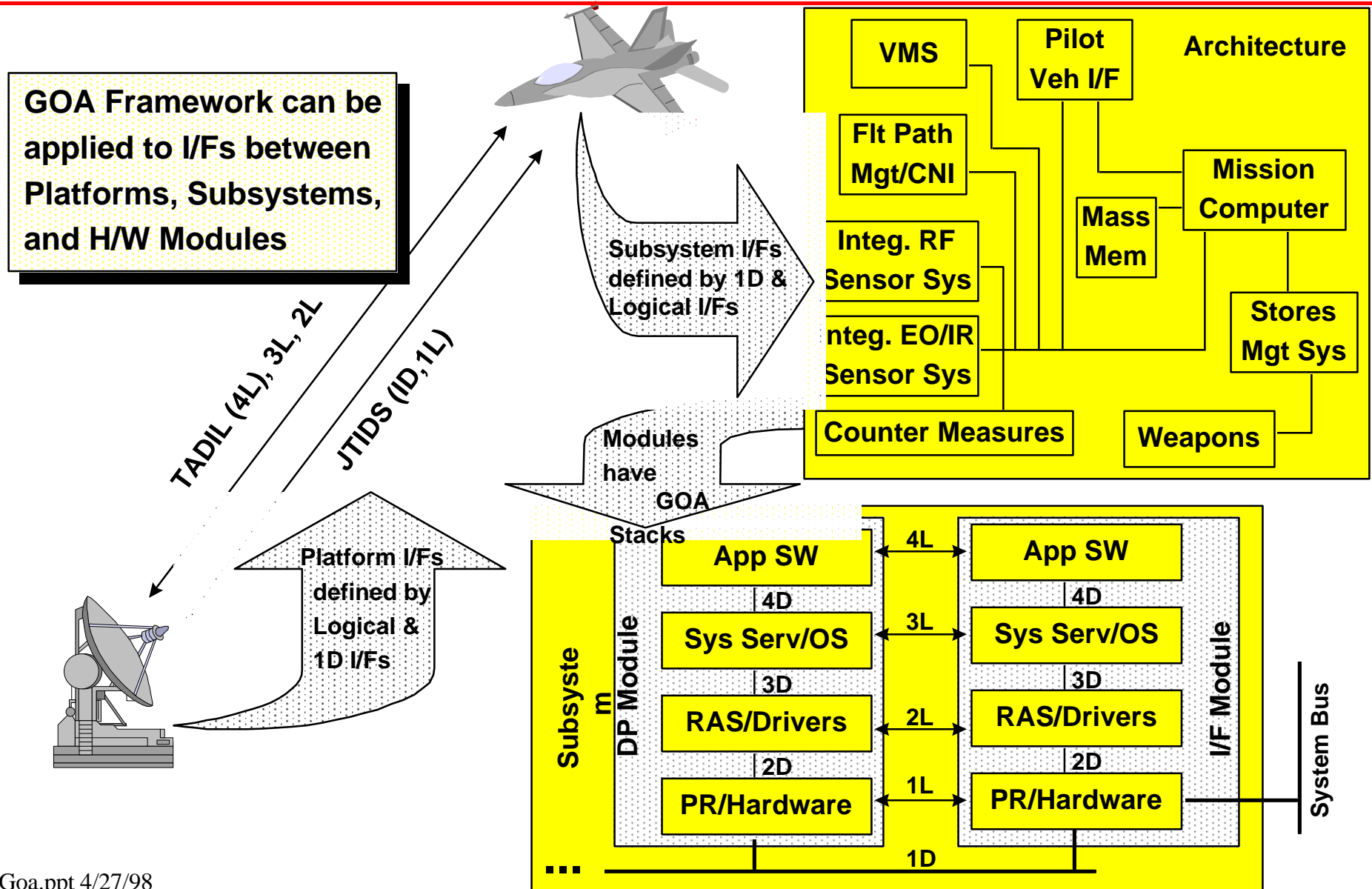
KEY: API = Applications Platform Interface XOS = eXtended Operating System L = Logical D = Direct X = eXpress
OS = Operating Sys RTE = Run Time Environment

GOA Framework View 2 Interfacing Within a System

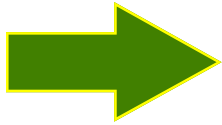


- | | |
|--|--|
| 4L Applications Logical Peer IFs | 2L Resource Access Services Logical Peer IFs |
| 4D Applications-to-System Services Direct IFs | 2D Resource Access Serv.-to-Phys. Resources Direct IFs |
| 3L System Services Logical Peer IFs | 1L Physical Resources Logical Peer IFs |
| 3D Sys. Services SW-to-Resource Access Services Direct IFs | 1D Physical Resources-to-Physical Resources Direct IFs |
| 3X OS Services-to-XOS Services Direct IFs | |

Hierarchical Application of the GOA Framework



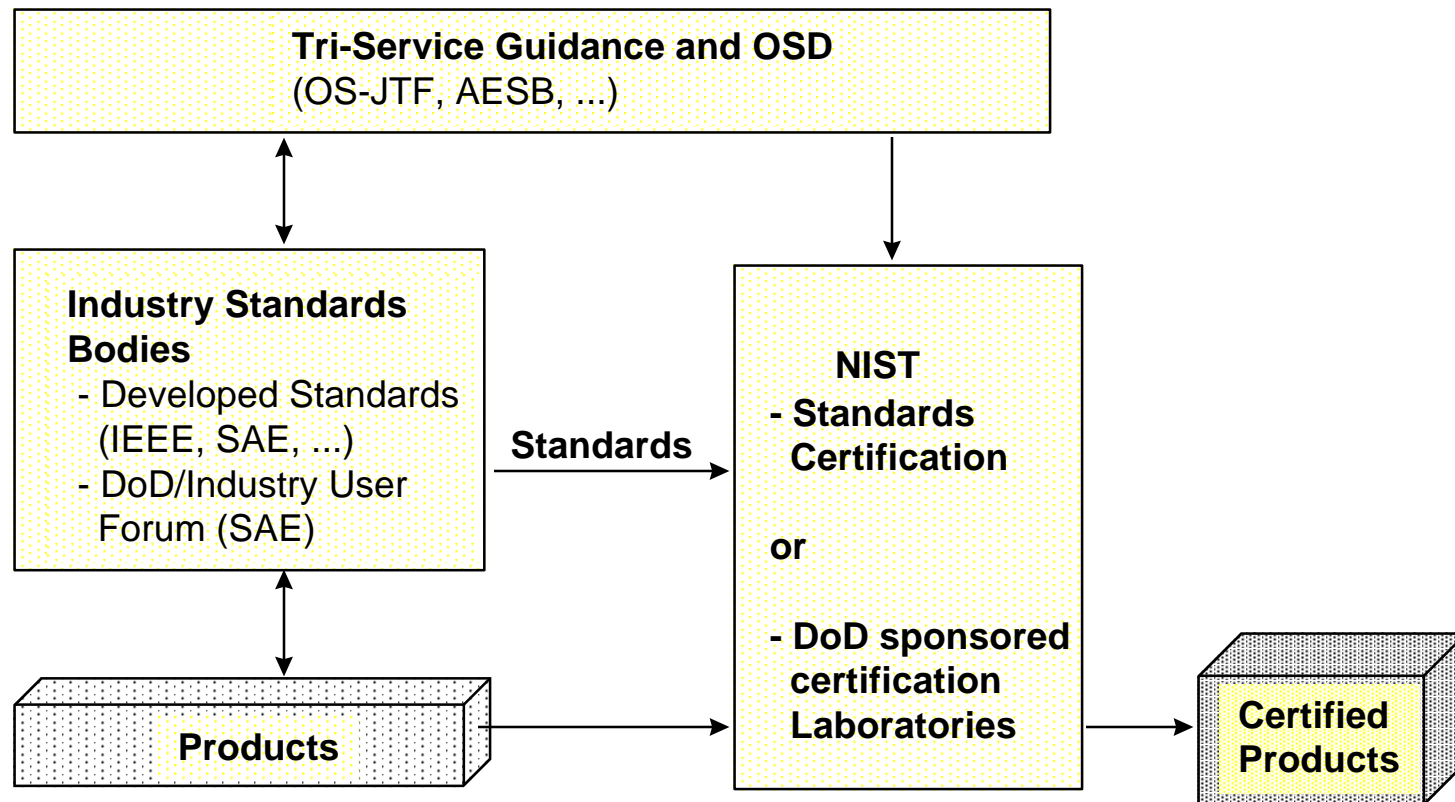
- **Description of GOA Framework**



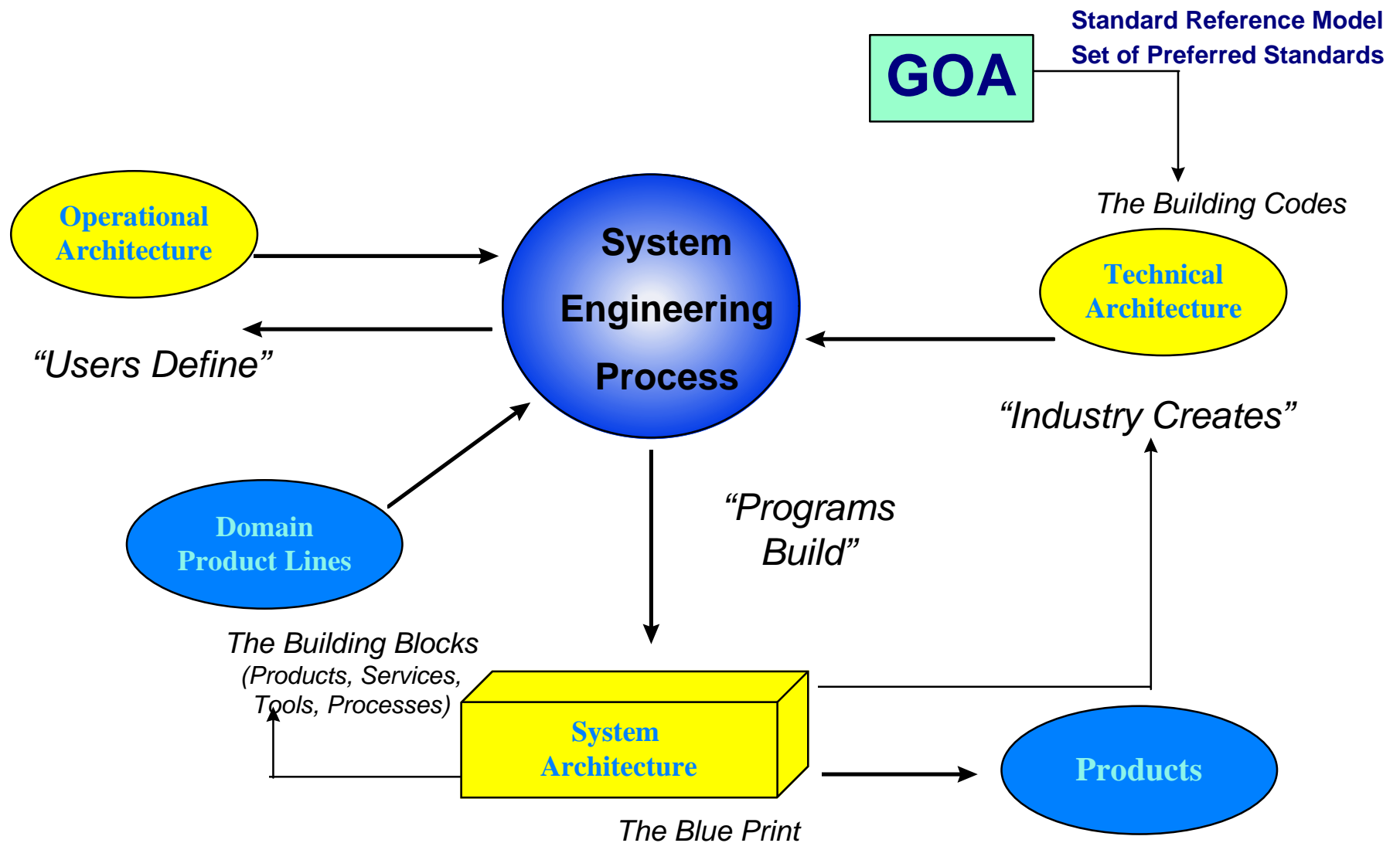
Preferred Set of Standards Catalogs

- **Need for the Catalogs**
 - **Process for Developing Catalogs**
 - **Status of Avionics Catalog Development**
- **Summary**

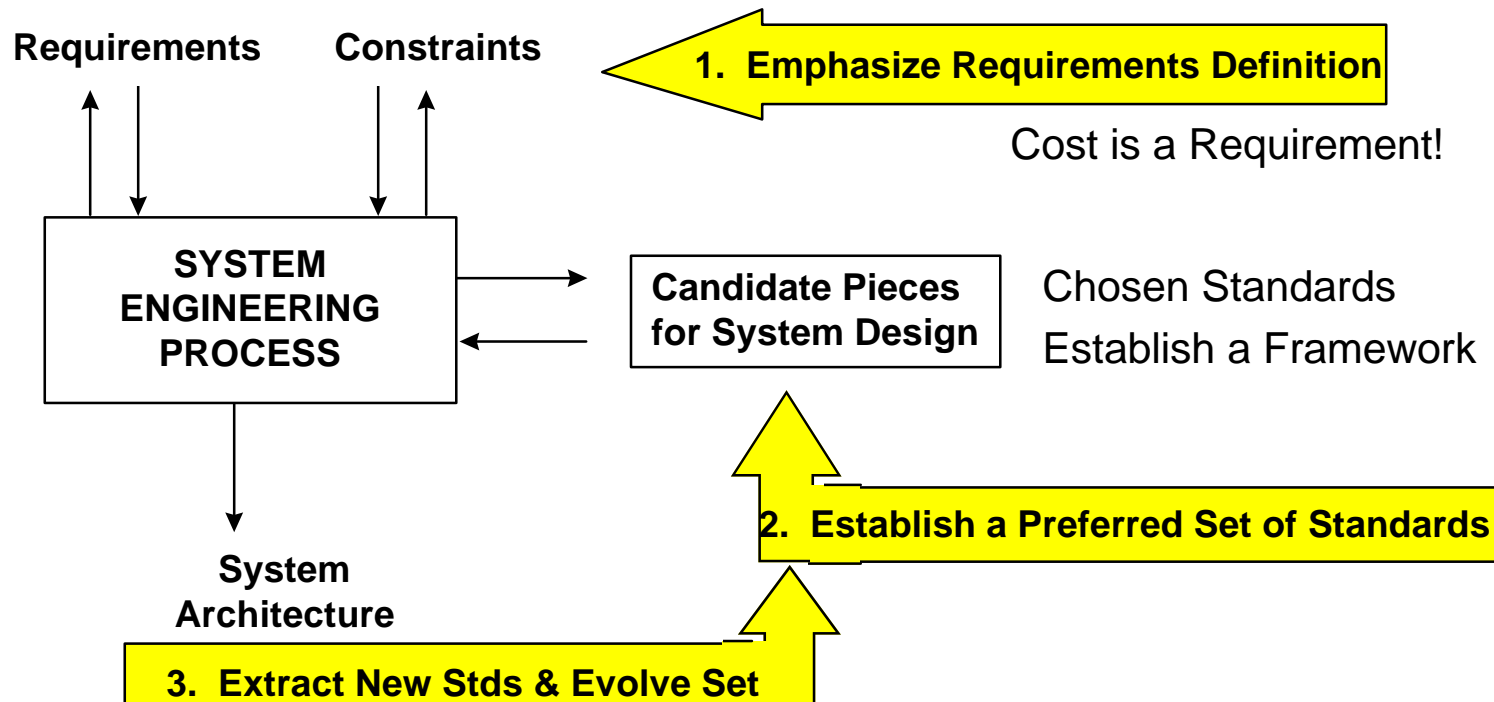
Policy Direction & Open Systems Products Process Flow



GOA Provides the Structure for Technical Architectures

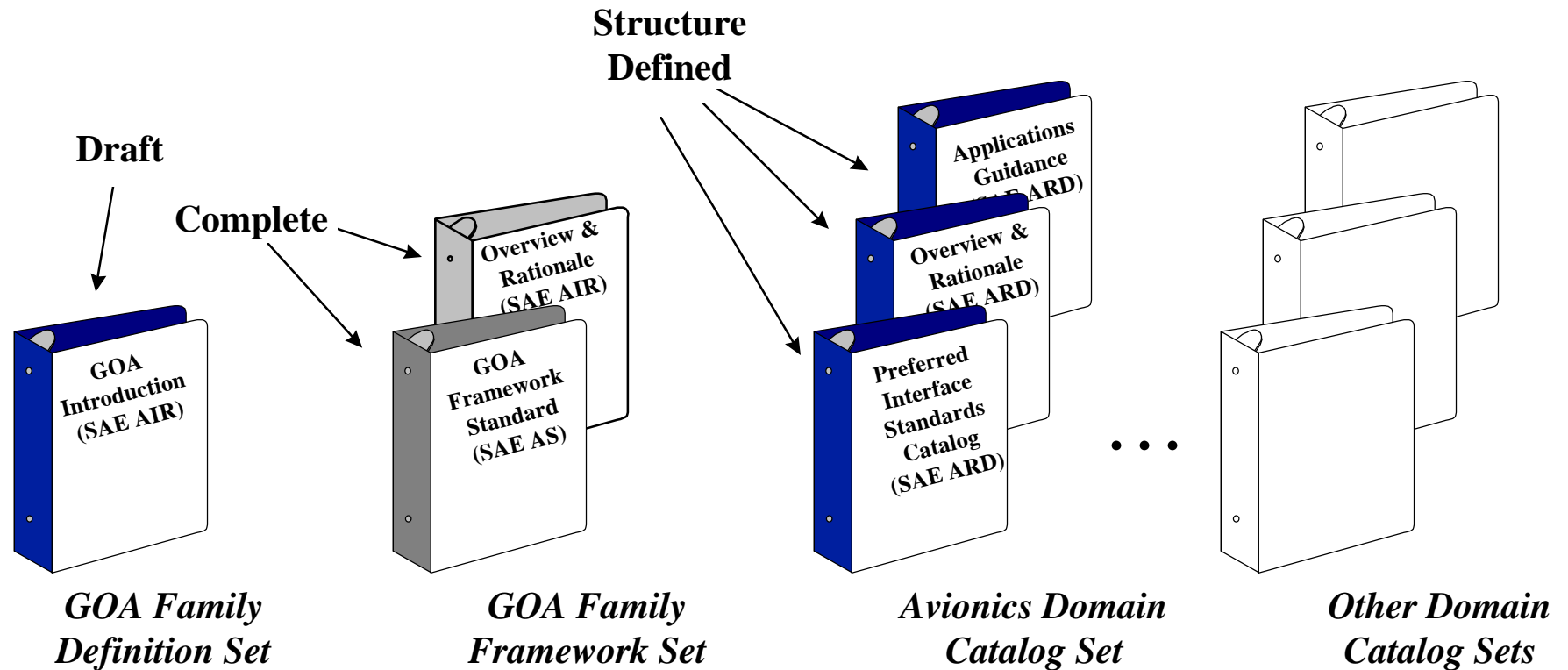


Raytheon Assumption: Preferred Set of Standards Catalog(s) are Needed



Recommended Open Systems Architecture Development Process - Ensures System Requirements are Met and Establishes a Framework That Enables Re-Use for Affordability. Preferred Set of Standards Catalog(s) are Key Ingredient of this Process.

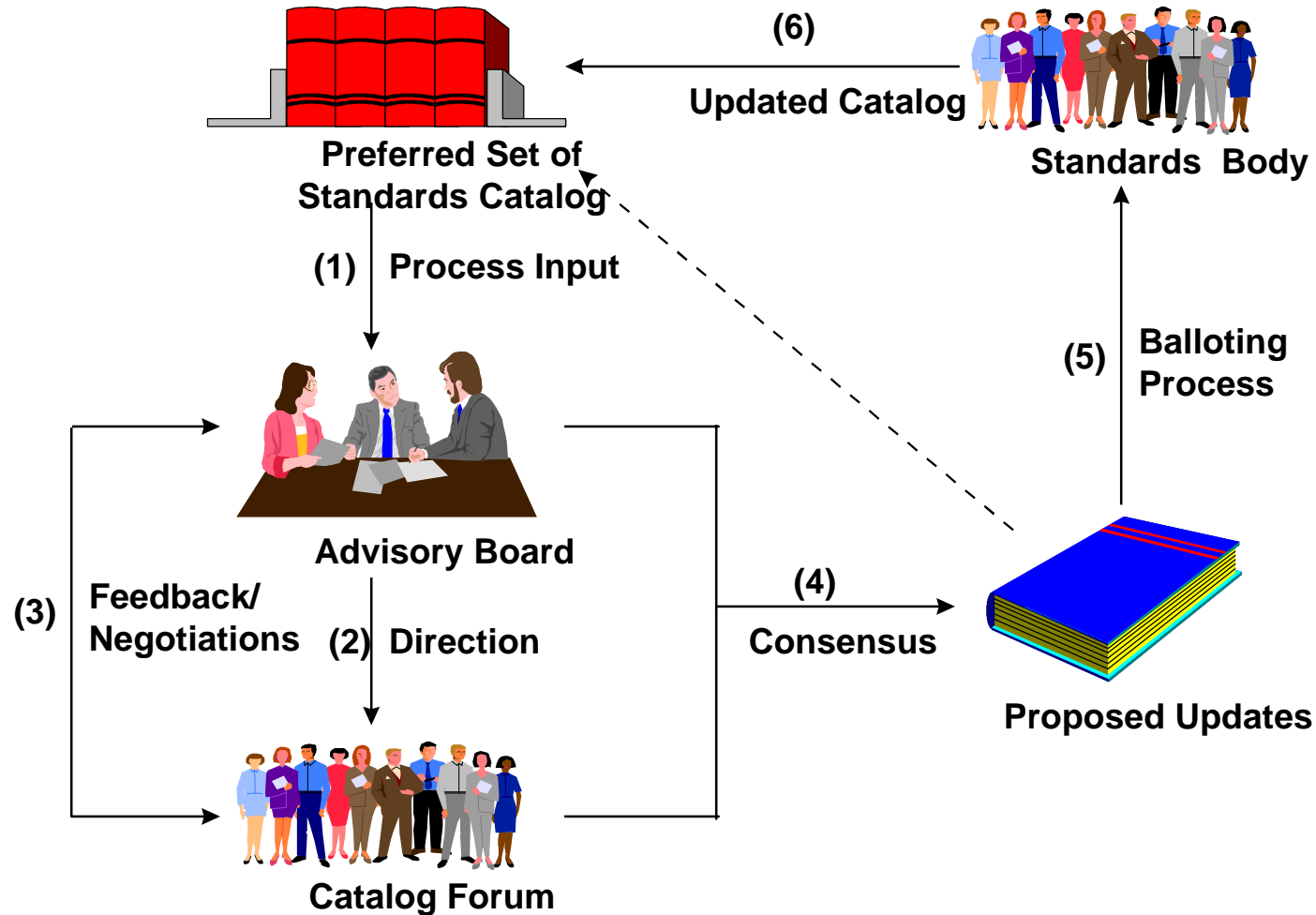
GOA Document Family Overview



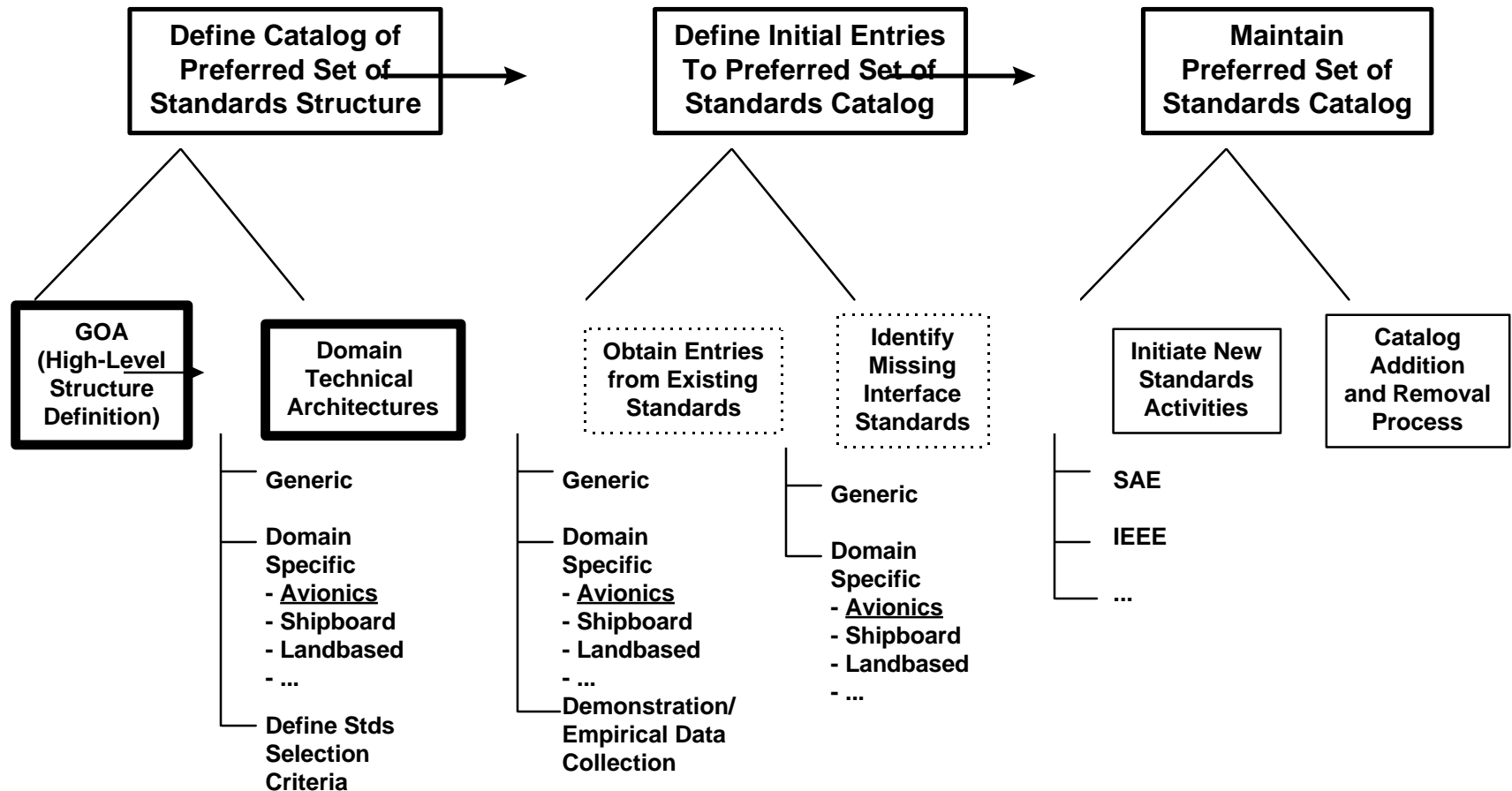
Preferred Set of Standards Definition

- Action on-going within DoD and SAE to define preferred set of standards for avionics domain
- Approach:
 - AESB has begun definition for DoD avionics domain
 - SAE is providing an industry forum for consensus and is defining structure of standards catalog using GOA framework as starting point
 - Management of avionics standards catalog(s) will come through OS-JTF and likely use SAE as industry forum
 - Certification to standards will likely be managed by NIST and Service certification laboratories

Preferred Set of Standards Catalog Process High Level View



Preferred Set of Standards Catalog Process Low Level View



» **Tasks for the Catalog Forum**

GOA Status

- **GOA passed ballot as SAE standard in Dec 1995 and is designated SAE standard SAE AS4893, date Jan 1996**
- **Overview and Rationale for GOA Framework SAE AIR5315 approved Mar 1998**
- **Joint Commander's Group AESB is one sponsor of GOA**
- **Army WSTAWG calling out GOA instead of TAFIM Reference Model**
- **OS-JTF and Army WSTAWG have partially funded GOA efforts (see next slide)**
- **Two major On-going efforts:**
 - **Guidance Document**
 - **Preferred Set of Standards Catalog for Avionics Domain**

Populating Catalog

- Requires significant amount of effort to do thoroughly
- Requires buy-in and involvement of primary stakeholders
 - Programs
 - Certification Bodies
 - Standards Bodies
- Process ongoing within SAE:
 - **Step 1:** Identify interface classes and components at each level
 - Application to application software logical interfaces (4L)
hardest to define because of proprietary nature
 - Application software to system services interfaces (4D)
often contentious

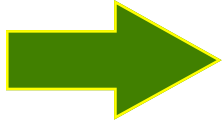
Populating Catalog, cont.

- **Step 2:** Define requirements for each interface class
 - 3-month to 2-year effort if performed in industry forum
 - ~2 years required to define 4D interface requirements
- **Step 3:** Map requirements to existing standards, profile existing standards, and create new ones where none exist - requires:
 - Thorough understanding of requirements
 - Sufficient time to completely comprehend existing standards
- **Step 4:** Prioritize work to be done:
 - Application to system software interface and interconnects, e.g., often drive system design so concentrate on them first

Catalog Status

- Letter to be mailed out to industry to help identify application software (4L) logical interfaces for avionics
- Application to systems services Interface requirements defined and profile definition of POSIX under way
- Other System Services identified, interface requirements definition beginning
- Studying UDI for System Services to Resource Access Services (drivers) interface
- Software to hardware and hardware to hardware interfaces:
 - Identified specific component types for which interfaces are to be defined
 - Interface requirements definitions beginning

- **Description of GOA Framework**
- **Preferred Set of Standards Catalogs**
 - **Need for the Catalogs**
 - **Process for Developing Catalogs**
 - **Status of Avionics Catalog Development**



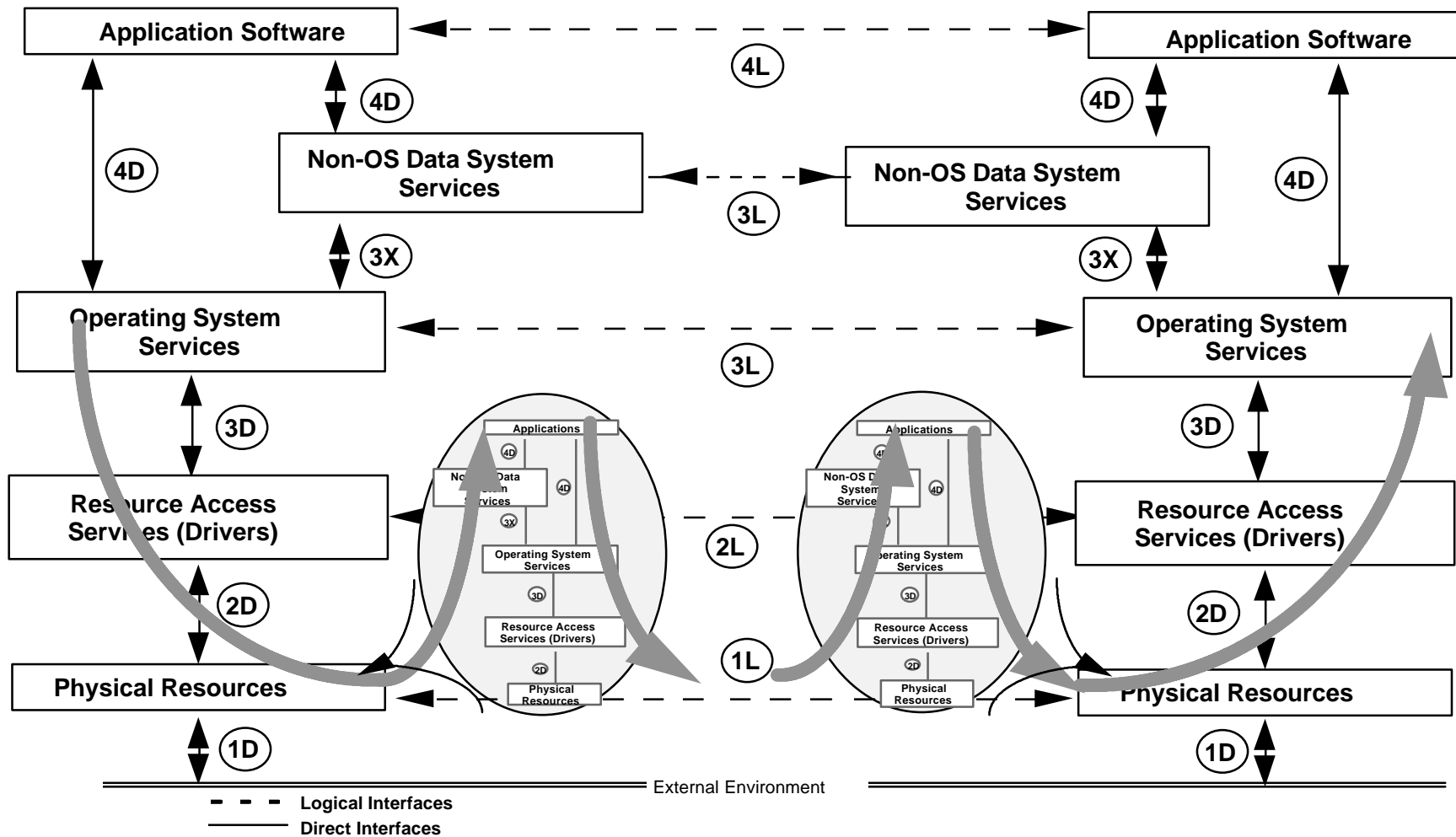
Summary

Summary

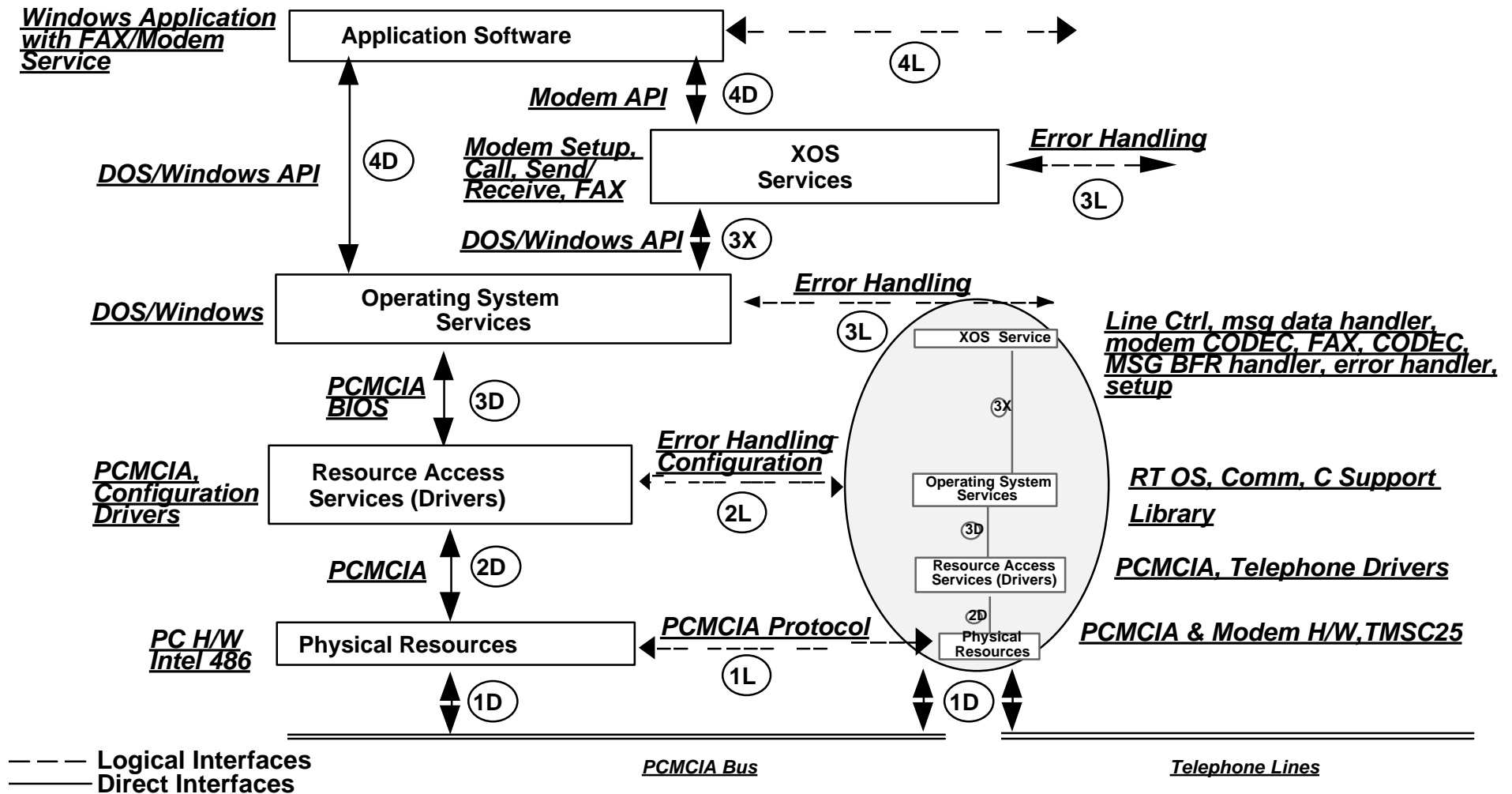
- **The GOA Framework was developed as an aid to develop, maintain, and evolve more affordable systems and enable greater combat capability.**
- **GOA is the proposed open systems framework for military avionics and other weapon systems domains in U.S.**
- **The GOA Framework is SAE standard SAE AS 4893.**
- **The SAE has defined structure of GOA Document Family and is in the midst of:**
 - **developing a preferred set of standards catalog for avionics**
 - **developing a guidance document for applying the GOA in avionics systems**

Backups

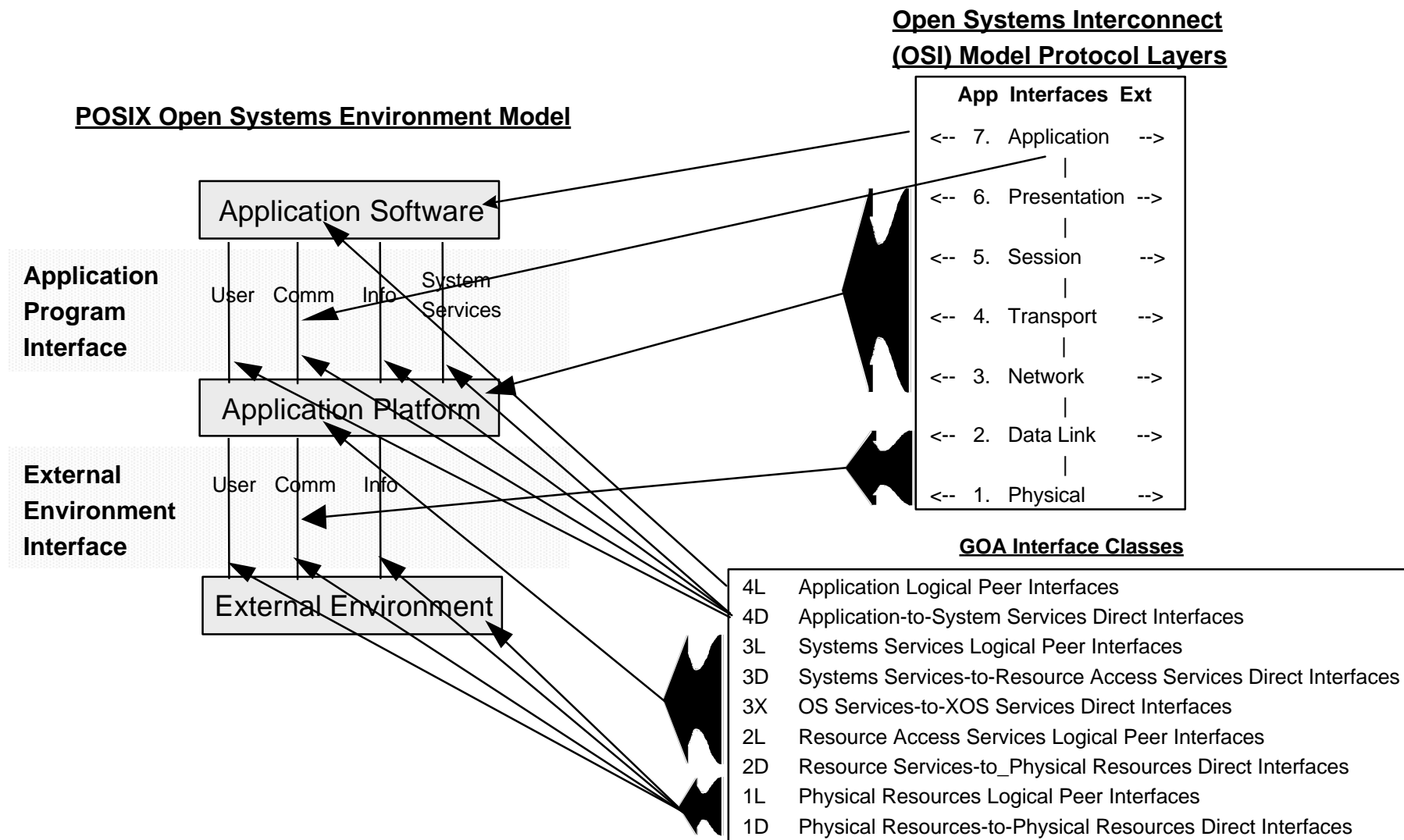
GOA Interface Model is Recursive



GOA Example - PCMCIA



Raytheon Relationship of GOA to OSI & POSIX Models



GENERIC OPEN ARCHITECTURE BASELINE OF AN AVIATION PLATFORM

AVIATION FORCE XXI OFFICE

MICHAEL WALSH

walshm@redstone.army.mil

256-313-4879 29 MAY 98

APPLICATION

- **Apply GOA TRM to AH-64D Longbow**
- **Apply to all Avionics components**
 - **Major systems/subsystems and related interfaces**
- **Provide baseline of component interfaces aligning functionality with architecture**

CONTRACT AWARD

- **INFINITY TECHNOLOGIES, INC. 8(a)**
 - **Well rounded client base including writing F-22 Avionics S/W (50+M lines of code) as well as Information systems, etc.**
- **36 MM effort over 8 months**
- **60% Draft solution 4 months in**
- **Money from WSTAWG now in place**
- **Projected start mid May**

PRODUCTS

- **Recommend changes/suitability of GOA TRM to WSTAWG Framework Document for inclusion in the JTA**
- **Aviation platform functional interface baseline against a well defined/industry coordinated TRM with applicable list of preferred standards to aid future procurements**
- **Recommendations to educate user community on benefits, S/W reuse, cost avoidance/savings, degrees of implementation, etc.**

SUMMARY/RECOMMENDATIONS

- **Provide results and recommendations to PMs and WSTAWG, and provide input to update Framework Document for V2.X**
 - Include V 2.X with preferred standards in JTA
 - Identify any changes required to Weapons Framework
- **Discuss benefits of using revised Framework to baseline other platforms**
 - Missile, tank, fixed wing, etc.. - Iterative process
- **Working toward making mandated JTA tolerable to real time, embedded weapon systems**
- **This puts the accepted tri-service weapon system TRM to its first test for suitability**